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ABSTRACT

This editorial introduces the 25th volume of the International Journal of Sustainable Energy Planning and Management. This volume presents research on low-temperature district heating in China, prospects for energy savings in Aalborg, Denmark, and impacts on heating systems, offshore wind power and electricity interconnection in the Baltic sea, integration of electricity markets in the United States, and finally the modelling of renewable energy systems both on the remote island of Bonaire and in Chile.

Keywords:

District heating;
Offshore wind energy;
Variable renewable energy;
Energy system modelling;
Market integration;

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1. Heat supply and savings

Benefits of low-temperature district heating include increased efficiencies and improved synergy with renewable energy and waste heat; effects that are well documented in the 4th generation district heating framework [1–3] in this journal and elsewhere. In a study on low-temperature district heating in North China, Bai [4] proposes a data-based temperature control method aimed at reducing the supply and return temperatures in district heating. The model is based on actual operation data for a district heating system in North China, and the results indicate that supply temperature reductions can be obtained while improving heating efficiency and safety.

Nielsen et al. [5] investigate the prospects of heat savings using Aalborg Municipality, Denmark, as a case. While heat savings affect production of heat directly through sheer reduction, savings also impact the efficiency of the heat supply system. The feasible level of savings is dependent on the actual building and the heat technology employed. In Aalborg, the results show that 30% heat savings are feasible for buildings connected to district heating, while potentials are larger for buildings with heat pumps (35%) and oil boilers (37%). This is based on a socioeconomic brake-even between supply and savings' costs.

2. Offshore wind and electricity grids

In a study on transnational interconnection of large-scale offshore wind parks, Bergaentzlé et al. [6] tackle the inherent regulatory challenges related to such complex meshed offshore grid infrastructures through an investigation of the present regulatory framework of countries surrounding the Baltic Sea. Based on identified key regulatory barriers, an ideal regulatory framework is proposed alongside concrete policy recommendations, with the aim of supporting the continued development of meshed offshore grid structures. The authors argue that the current lack of coordination among European countries and varying country-specific regulation makes for an uneven playing field, hindering an increased deployment of meshed offshore grids.

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3. Electricity trade and market integration

Dahlke [7] study the short-term impacts of increased integration of regional electricity markets in the Western United States. Looking into the state of California, the study presents estimations of how electricity imports correlate to electricity price changes and potential consumer savings, in addition to reduced emissions of CO_2, SO_2 and NO_x as a result of displaced natural gas. The results of the study underline the importance of integrated electricity markets due to the ensuing monetary and environmental savings related to increased regional trade.

4. Renewable energy system modelling

Two articles of this volume apply energy system modelling in vastly different contexts to investigate the technical and economic feasibility of renewable energy systems, and in addition, one article focuses on requirements for a database on energy systems scenario data.

Using the energy system modelling software HOMER, Tariq [8] addresses the challenges related to renewable energy supply on islands. In a case study of the island of Bonaire, a renewable energy scenario is developed where the integration of electricity from wind and solar resources is facilitated through seasonal hydrogen storage and short-term battery storage. Based on the energy system modelling and scenario analysis of the study, Tariq concludes that transitioning to a renewable energy system can significantly reduce fossil fuel dependency while at the same time reducing the levelized cost of electricity.

Aravenaa et al. [9] conduct simulations of the Chile energy system with the LUT energy system transition model, investigating how the presently abundant renewable energy sources such as solar and wind resources can be used to reduce fossil fuel dependency. The authors argue that a 100% renewable energy system in Chile is technically feasible and cost-efficient, however large-scale electrification of energy demands is considered essential to the transition.

Reder et al. [10] present the results of a user-survey into what requirement energy systems scenario developers and modellers have for data bases to share scenario data. Their survey showed a willingness in the modelling community to share data, and among the *"two most important ranked criteria were 'references for all datasets' and 'quality check of uploaded data'."* These results arise from the project *SzenarienDB* that focus amongst others on tansparency and comparability of energy scenarios.

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